

Guatemala, an Early Spectrum Management Reformer

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Guatemala, the most populated State in Central America with 15.7 million people and 3,340 USD\$ GNI per capita in 2013, is an example of early spectrum management liberalization. The enactment of the General Telecommunications Law in 1996 in Guatemala was a milestone in that country's spectrum management. It had big implications also for other developing countries as Guatemala was one of the first countries to move in the direction of market mechanisms, including auctions, for allocating spectrum. Article 54 states that any person or company might request the right to use a non-previously allocated spectrum band. The petitioner shall participate in a public tender to obtain a license "*Título de Usufructo de Frecuencias*" (TUF), and once the license is granted, the licensee has the right to determine the service and technology to implement. Bands can be leased, sold, or subdivided during the period of time set forth in the license and the only restrictions imposed, are the frequency range, the maximum power transmitted in the band and at adjacent bands, the geographic scope, and license duration. Although not all frequency bands are available within this model—some are reserved for public services and the radio amateur service—a big portion of the useable radio spectrum is now allocated under this regime in Guatemala. The regulator "Superintendencia de Telecomunicaciones (SIT)" is responsible to enforce the rules and to solve any dispute over the rights of use that interferences might cause.

At the time, this approach to spectrum management was revolutionary, since the common practice for allocating frequencies was normally the opposite: the regulator specified in a license the service and technology to be used in each frequency band, and any change to these conditions was not allowed without prior regulator's approval.

The idea behind the Guatemalan case, however, is not new; as early as 1959 Ronald Coase (1959, 1960) pointed out that a regulator allocating the spectrum would face the problem of efficiently assign the frequencies without reliable information on the market value of the band and consumer preferences. Furthermore, the regulator would be subject to political pressure, thus making allocations potentially inefficient.

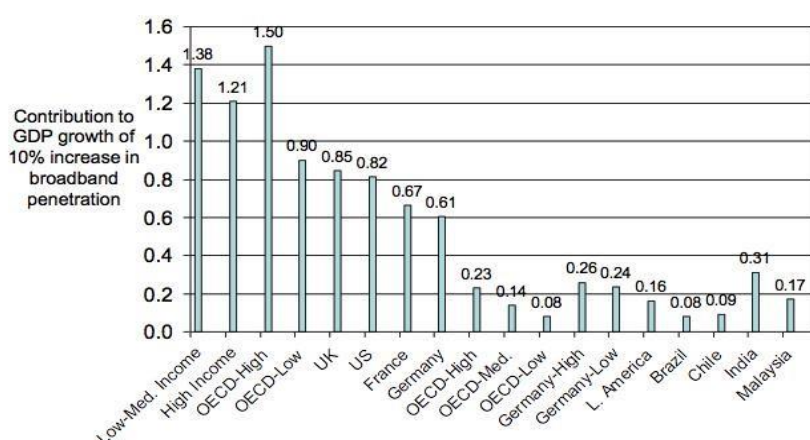
Notwithstanding, there are powerful arguments for regulating spectrum allocations as a scarce resource. These stem from the likelihood of interference between radio communication services, economies of scale, externalities linked to some of the commercial services using the spectrum, the existence of services which may be considered pure public goods, along with conditioning factors linked to the legacy usage of spectrum. While the concept of best practice in spectrum management regime remains controversial, the case of Guatemala is a perfect 'experiment' to discern the effect of policies where the market is afforded a more important role in the allocation of frequencies.

When Coase wrote his paper, spectrum scarcity was not a major issue. Nowadays, though, spectrum management has become a major policy concern and a topic of increasing interest in the economic literature. The extraordinary growth in the use of smartphones and other wireless devices and the emergence of new services and applications are increasing traffic demand exponentially and consistently spectrum usage. The Radio-communication Bureau of the International Telecommunication Union (ITU), the UN specialized agency for telecommunications in 2007 estimated the need for additional spectrum for mobile broadband as between 1,280 and 1,720 MHz by 2020 (ITU, 2007). But the impressive growth of traffic

meant even these forecasts fell short, and ITU is conducting a new review of to update these estimates ahead of a future World Radio Conference, where additional allocations for mobile broadband may be made, ITU (2013).

Broadband and its wireless component have been identified as a source of increased growth and productivity rates; see World Bank (2009), Czernich et al (2011), Koutroumpis (2009). In developing countries, the demand for spectrum to unlock mobile broadband's potential for growth is located in the upper band of the estimates. Wireless access is in many cases the only practical and affordable way to expand internet access in developing countries. That's because many developing countries lack legacy fixed networks of copper loops and widespread mobile coverage undermines the business case for building new ones, especially in rural and sparsely populated areas.

Figure 1: Research evidence of broadband impact on GDP growth in different regions



Source: R. Katz (2010) The impact of broadband on the economy: Research to date and policy issues.

The impact of the reform

In 1996 the Guatemalan Government carried out a spectrum policy reform to liberalize the allocation of frequencies. Before the reform, spectrum markets were regulated by a State Agency for frequencies below 800 MHz, and a State owned company controlled frequencies above 800MHz. Mobile telephony was an exception since it was provided by a private company that gave a share of its profits to the stated-owned company. The Guatemalan reform was followed by a similar reform in El Salvador.

Mobile telephony and wireless broadband can be considered the most successful commercial services using the spectrum over the last 20 years¹, consequently the amount of spectrum devoted to mobile services in the years since the reform is a good indicator of the ability of a spectrum management regime to allocate the bands to the usage that the market gives the highest value.

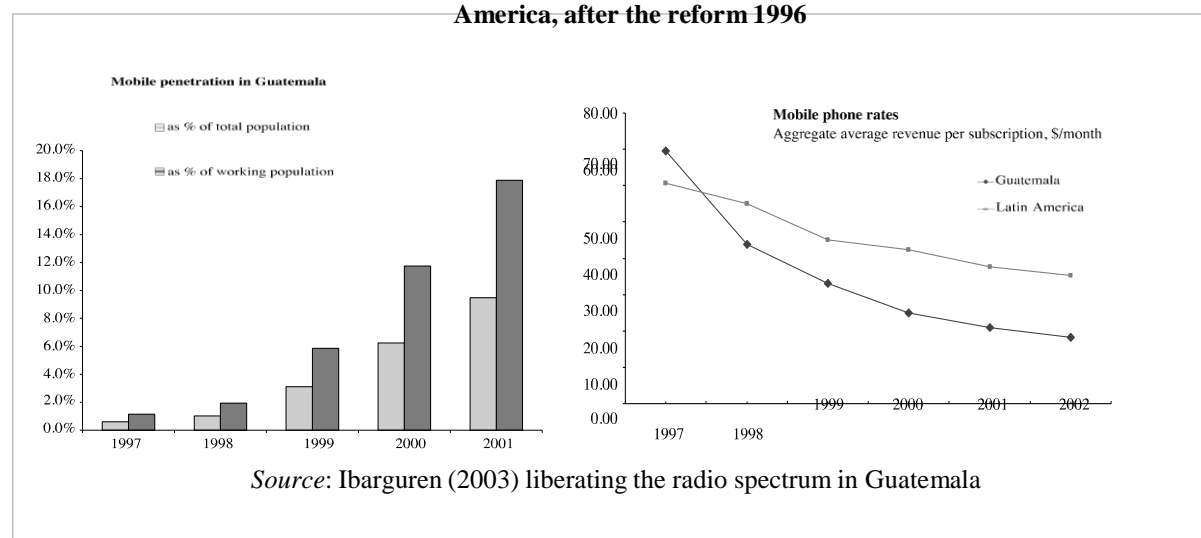
Penetration rates, and retail prices are good indicators of a market's degree of competition; Ibarguren (2003) analyzes the time series of the Guatemalan mobile penetration and the retail prices in the years immediately following the reform and compares this data with the time

¹ For example a study carried out by Analysys Mason (2012) for the UK, estimates that some 58% of the value of radio spectrum in the UK – £30.2 billion – comes from public mobile communications. The second most valuable service is broadcasting – £10.8 billion or 21% of total spectrum value.

series of an average of Latin American countries. Penetration grew in Guatemala at an annually compounded rate of 71.7% between 1997 and 2001, compared to 46.8% for the Latin American

average. Average retail prices for mobile services in Guatemala were only halve² the Latin American average in 2002.

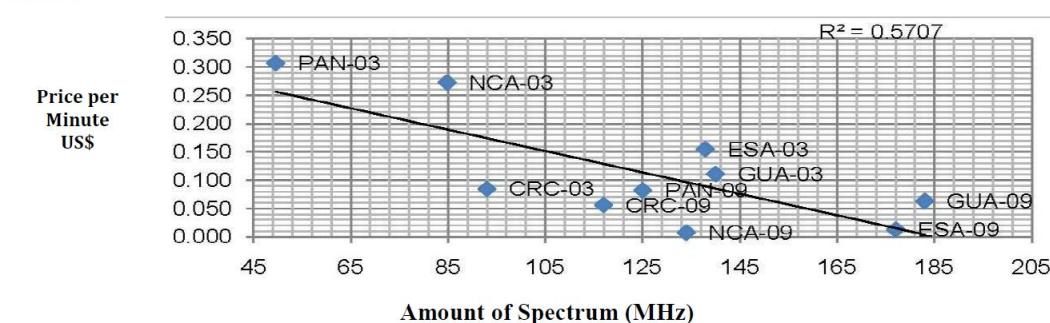
Figure 2: Mobile Penetration (RHS) and ARPU as proxy of retail prices in Guatemala, and Latin America, after the reform 1996



A higher amount of spectrum allocated to the mobile service is expected to yield increased competition, penetration rates, and lower prices. IDRC (2010) analyzes the correlation between spectrum allocations and the average price per minute of mobile voice calls, the Herfindahl-Hirschman Index of telephony market concentration and the percentage rate of mobile phone penetration for Costa Rica, El Salvador, Guatemala, Nicaragua and Panama.

Figure 3 shows an inverse and significant correlation between the amount of spectrum allocated to the mobile service and the price per minute of a mobile call. Countries that carried out spectrum liberalization, principally El Salvador and Guatemala, allocated higher amounts of spectrum to mobile communications in 2003, and by 2009, both enjoyed lower prices than countries where spectrum regimes were not liberalized (Costa Rica, Nicaragua and Panama), though prices declined in all countries sampled.

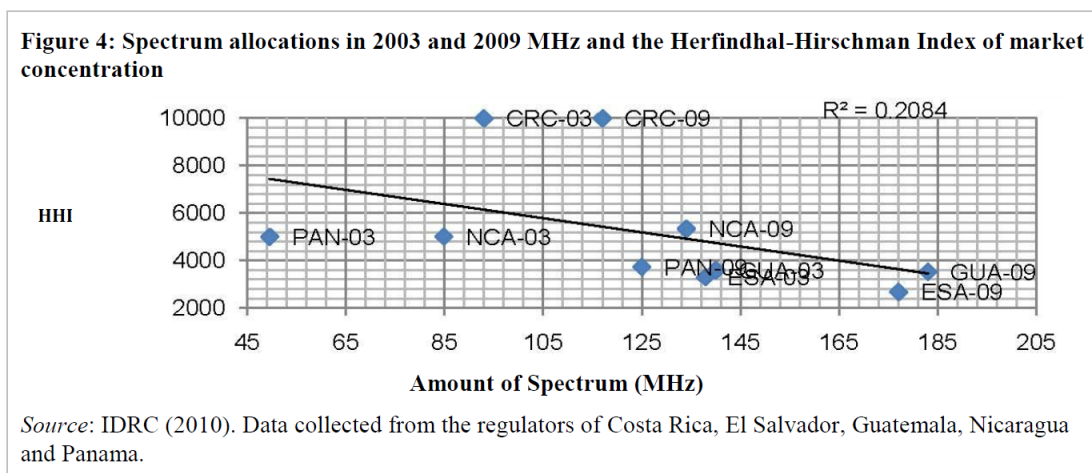
Figure 3: Spectrum allocations in 2003 and 2009 MHz and to average price per minute in US\$ per minute



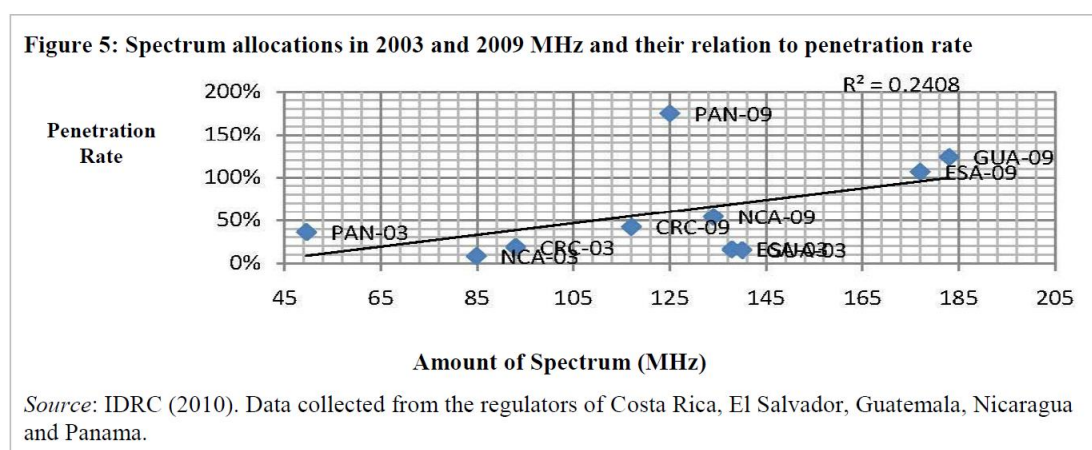
Source: IDRC (2010). Data collected from the regulators of Costa Rica, El Salvador, Guatemala, Nicaragua and Panama.

² Retail prices were estimated in the study using a proxy, the average revenue per subscription, to avoid problems associated with non-linear pricing.

Concerning market structure and competition, Figure 4 shows a significant correlation between the amount of spectrum allocated to the mobile service and lower figures in the HH Index and therefore a higher degree of competition in countries with liberalized spectrum markets. It should be noted however, that in the case of Costa Rica mobile telephony was supplied by a government monopoly until 2011 and this make more difficult to interpret the data.



With regard to the penetration rate Figure 5 exhibits a significant correlation between the amount of spectrum for the mobile service and the penetration rate. Except for the case of Panama, where the mobile market departed from a regulated monopoly to a competitive market in 2003, El Salvador and Guatemala are the countries with higher penetration rates.



The relationship between the spectrum reform, increased competition and fall in retail prices might be spurious. An analysis controlling for additional variables is needed. Hazlett et al (2006) carried out an econometric study of the Guatemalan reform using a dataset³ of 16 Latin American countries with annual data between 2000-2004, in order to test if the higher amount

³ The study includes the following variables: GDP per Capita, the Fraser Index of Economic freedom, population density, fixed line penetration, the percentage of population that live in urban areas and the percentage of GDP tied to the mobile service as controlling variables. The study confirms that the reform explains the increased spectrum devoted to mobile communications in Guatemala and El Salvador, as the significant correlation cannot be explained by other variables, such as GDP per Capita or the Fraser Index, since these two countries are associated with relatively lower levels of income and economic freedom.

of spectrum brought about by the reform was the explanatory variable for increased competition and fall in retail prices. They found that liberalization has achieved its policy goals in the cases of Guatemala and El Salvador. There is a positive relationship between the amount of spectrum and the degree of competition and a negative correlation between the amount of spectrum and retail prices.

Current situation

Spectrum management policies similar to those of Guatemala, e.g. the use of auctions to allocate spectrum, have currently been accomplished by several countries in the region. Some of these countries have surpassed the amount of spectrum that Guatemala allocates to the mobile service. For example, Dominican Republic, Mexico and Honduras currently exceed Guatemala's figures.

Two reasons might explain why other countries in the region have overtaken Guatemala in terms of the availability of spectrum to the mobile service. First, although the Guatemalan spectrum regime enables the use of market mechanisms to allocate spectrum in the so-called regulated bands, the procedures to assess the feasibility and effectively change an allocation from public to regulated where market demands additional spectrum have not been addressed in the Telecommunications Act.

In April 2015, the Guatemalan spectrum regulator, SIT, transformed the bands 1670-1859 MHz and 2110-2290 MHz from frequencies reserved for public usage to regulated bands subject to the grant of TUF licenses⁴. The resolution SIT 265/2015 stated that although the entire suitable spectrum available in regulated bands had already been allocated to the mobile service, there would not be enough frequencies to meet demand for mobile broadband if additional spectrum were not allocated to the mobile service. However one month later, the resolution SIT-369-2015⁵ revoked resolution SIT 265/2015 stating that the transformation of the spectrum use from public to regulated shall be suspended under the contentious administrative court provisions.

Secondly, it may be difficult to change the use of spectrum even in regulated bands because of the existence of coordination failures in the transaction of TUFs in certain bands. For example, the broadcasting of television signals is a public service that requires the grant of TUF licenses. Broadcasters are willing to change the technology of emissions from analogue to digital in order to either diminish the number of TUFs they need to provide the service or increase the number of television channels. Potential spectrum users, such as mobile operators, are also willing to participate in the auction of frequencies from the analogue to digital transition in order to meet demand for mobile broadband. Also the regulator is keen to facilitate the transition from analogue to digital because it would allow a more efficient spectrum usage, increased revenues for the regulator and enhanced cultural diversity from the increased number of television channels. However, for the transition from analogue to digital television to reap the benefits of additional services two elements must exist. There should exist a mechanism to re-organize frequencies allocated to the broadcasting service to made available a contiguous spectrum block suitable for the provision of mobile broadband and a procedure to sell some TUF's from broadcasters to mobile operators—or other spectrum users—in such a way that both can benefit from the transaction. This will not occur without a coordinated process managed by the regulator. The Guatemalan regulator has lagged behind in this process with

⁴ Resolution 265/2015 available at: <http://www.sit.gob.gt/index.php/2014-05-28-20-40-10/resoluciones>

⁵ Resolution 369/2015 available at: <http://www.sit.gob.gt/index.php/2014-05-28-20-40-10/resoluciones>

regard to other countries such as Mexico that will finish the transition from analogue to digital in December 2015 or the Dominican Republic that will also finish the transition in 2015.

Conclusions and policy recommendations

Existing literature support the hypothesis of social welfare gains associated with an increased market role in spectrum allocation. The case of Guatemala is an example of how market mechanisms for allocation can improve competition and efficiency in spectrum markets.

Although initially liberalization allowed Guatemala to leapfrog its regional peer countries regarding the amount of spectrum allocated to the mobile service, increased competition and lower prices. Allocations are currently similar or less to those accomplished by other countries in the region such as Mexico, Dominican Republic or Honduras that also reformed the spectrum management regime.

Once the amount of spectrum identified to be granted with TUF licenses have been exhausted in Guatemala, the regulator needs to find a way to re-organize existing allocations. Mechanisms to assess the change of use from public to regulated where it is feasible and approaches to accelerate the change of use in regulated bands when coordination failures exist would help to alleviate tensions in spectrum demand.

The “Big Bang” reform that entails the possibility to lease, resell, or subdivide the spectrum and enables the change of service and technology should be balanced with a more gradual approach with increasing rights of use in selected bands. Other possibilities that allow higher market participation are also available. The utilization of administered incentive prices, where the regulator set administrative fees for the use of spectrum that try to emulate the market price of a frequency band in order to introduce price signals and encourage more efficient usage, the use of auctions as an allocation mechanism, the flexible use of spectrum authorizing the change of technology and service in a particular frequency band, are complementary solutions to the definition of property rights, and the existence of a secondary market for spectrum. The best approach for each country and spectrum band should be analyzed on a case by case basis. The existence of economies of scale in device manufacturing through global and regional spectrum harmonization and the advantage of a more important market role in spectrum allocations should be weighted in order to find the most efficient solution for each particular band and country. One size fit all policy solutions are not possible in spectrum management since the legacy usage of a spectrum band might be different in each country and is a key element to determine the cost and benefit of each approach.

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